

Western Instruments

Established 1965

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Operating Instructions

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WAD-10, with Foot Switch

WA-Series Magnetizing Coils



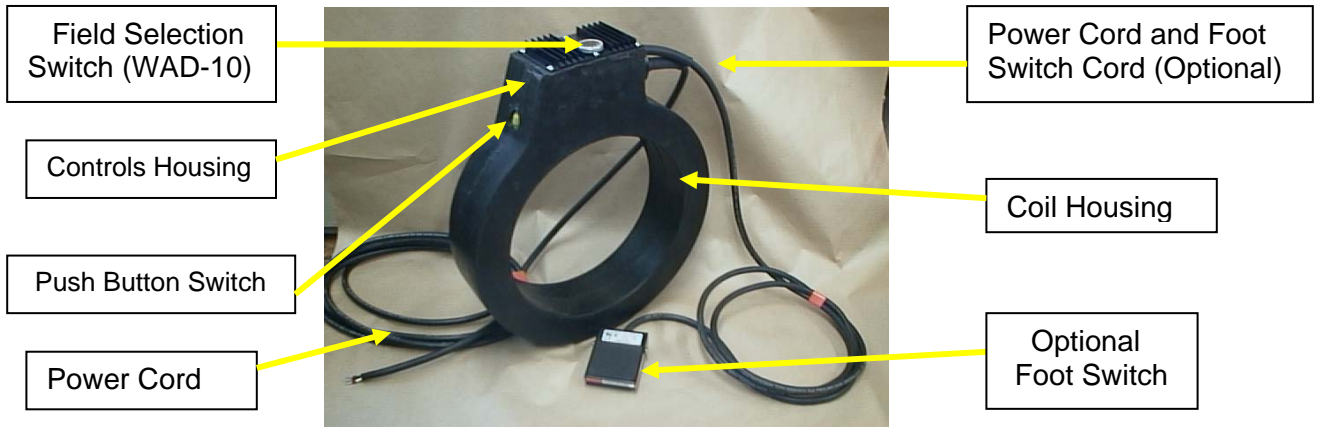
Western Instruments Inc.

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Operating Instructions for WA-Series Coils

WA-Series Coils are Operated from 115 VAC Power, with options for 230V (50 or 60Hz) and the WDC-10/24 from 24VDC. These Coils induce a Magnetic Field in the ferrous material being tested. As the unit conducts electricity in a circular fashion, it induces a Longitudinal Magnetic field in a Central Conductor. This device should be utilized within the parameters set by the operational specifications within this guide.

Illustration



Description

- 1. Coil Housing** – The Coil Housing is cast from a durable Urethane Rubber material, which protects the Aluminum Wire Core. This Robust encapsulant is resistant to cracking and disbonding due to age or high/low temperatures, and is suitable for Dry or Wet Method media. The Standard Coil size is 10" Inside Diameter, and is intended to be held in one hand with the operators Thumb used to push the Solid State Push Button Switch. The coil is available with a foot switch and Cast Coil Feet for bench top use.
- 2. Control Housing** – The Control Housing is used to mount the Solid State Push Button Switch and the Field Selection Switch (WAD-10). **Do not press the Push Button Switch when connection a WA-Series Coil to 'Mains' (AC) Power.** It is designed to protect the Control Components from damage due to the riggers of field or shop use. The reverse (or underside) of the Control Housing Cover Plate acts as the mounting for all of the Solid State Control Modules. As indicated, three different versions of controls are offered; the WAC-Series (AC only), the WAD-10 (AC and 5 settings of Pulsed DC), and the WDC-10/24 (DC only). The maximum AC output of these coils

is fixed at 3000 Ampere Turns, while the maximum DC output peaks at approximately 4000 Ampere Turns. With either the WAD-10 in any of the DC Levels or the WDC-10/24, the positive and negative sides of the coil are easily identified by the operator with the use of a Pocket Magnetometer (Field Indicator), such as a W-FI®.

WA-Series coils may be equipped with a foot switch as an option from the factory. The operator may activate the coil with either the foot switch or the Solid State Push Button switch. Operators should avoid activating both switches simultaneously.

DO NOT CHANGE THE FIELD SELECTION SWITCH, ON THE WAD-10, WHILE THE COIL IS ENERGIZED!

WAD Power Supply (AC/DC Coils)

WAD-10 V1. The Control Housing is used for mounting a Heat Sink on top, and the Control Module inside. Furthermore, in the middle of the heat sink is where the six position rotary Field Selection Switch is located for changing from AC to DC. Do not change the field selection switch on the WAD-10, while the coil is energized! The Field Selection Switch allows the operator to select AC operation, and five DC intensity levels. The Field is clearly indicated on the scale to the left of the switch.

WAD-10 Control Housing
(V1 Controls Illustrated)



The Field Selection Switch controls the electronic module, whereby semiconductors are used to change the magnetization field. Adjusting the field Selection Switch while the Push Button Switch is depressed (“on”) will cause an overload to the electronics module. If an overload occurs, components in the module will fail resulting in partial or complete failure to this component, thus all measures must be taken to avoid an overload.

WAD-10 V2. The V2 is the newest AC/DC Power Supply for use on the WAD-10. This Power Supply changes the controls slightly, on the AC/DC Coil. The V2 is equipped with a simple AC – DC Toggle Switch, and a Potentiometer to vary the DC intensity. Other operational parameters between the V1 and V2 are identical.

WAC Power Supply (WAC Coils) The Control Housing used in the WAC-Series Coils is fitted with a standard W-Series Strain Relief, and the Solid State Push Button Switch. The Switch Membrane is typically a color other than the black of the coil housing.

WDC-10/24 Power Supply is typically attached to a 24VDC Power Supply or 2 x 12 Volt Batteries connected in Series. The WDC-10/24 is simply supplied with a Momentary Toggle Switch fastened to the top of the Control Housing. Due to the high amount of DC Voltage flowing through the coil, the operator needs to be more mindful of heat built up in the Coil.

- 3. Duty Cycle** – The Duty Cycle (maximum duration) for periodic operation is set to avoid overheating of the Internal Aluminum Wire Coil and the Solid State Controls. Warm (or hot) Core Wires have an increased resistance, and will reduce the overall Ampere Turn output of the Coil. WA-Series Coils are fitted with Thermo-Protection Switch(s) that are Automatically resetting. These protection switches are; bonded to the wire core; and integrated in the Solid State Controls of the WAD Module. If either component exceeds the preset temperature, that particular circuit will automatically open and cause the unit to shut down. The unit will remain shut down until the automatic reset temperature is reached and the switch closes allowing the unit to be used again. **Do not press the Foot or Thumb Switch while plugging any coil into mains power!**

WAD Modules should not be activated, using the Push Button Switch or optional Foot Switch, at the maximum DC Setting for more than 2 minutes at a time. The activation time should be followed by an equal or longer cool down (or off) cycle. If the coil gets warm, the Thermo-Protection may deactivate the coil, conversely if the Heat Sink gets warm the Solid State Controls may be deactivated. If the unit is used for extended periods of time, with short periods of activation, the operator should be mindful of the temperature of the thermally protected components. If the operator has any concern about the actual or planned operation of the Coil, Western Instruments or the Distributor should be consulted.

WAC Modules (or WAD-10 coils used in AC mode) can be operated for extended periods of time (75% Duty Cycle), without overheating the Core. This time should not exceed 5 minutes, followed by a 2 ½ minute cool down cycle. If the WAC-10 coil gets warm, the Thermo-Protection may deactivate the coil. If the unit is used for extended periods of time, with short periods of activation, the operator should be mindful of the temperature of the coil housing. If the operator has any concern about the actual or planned operation of the Coil, Western Instruments or the Distributor should be consulted.

WDC-10/24 Power Supply is typically attached to a 24VDC Power Supply or 2 x 12 Volt Batteries connected in Series. This unit has a lower duty cycle (50%) than WA-Series Coils Supplied with Mains AC Voltage. This time

should not exceed 2 1/2 minutes, followed by a 2 ½ minute cool down cycle. If the unit is used for extended periods of time, with short periods of activation, the operator should be mindful of the temperature of the coil housing. If the operator has any concern about the actual or planned operation of the Coil, Western Instruments or the Distributor should be consulted.

**DO NOT CHANGE THE FIELD SETTINGS, ON THE WAD-10,
FROM AC TO DC WHILE THE COIL IS ACTIVATED!**

- 4. Field Characteristics** – WA-Series Coils are designed to induce a Longitudinal Field in a Work Piece positioned though the Centerline of the Coil. A Transverse Field may be introduced, if the Work Piece is short enough, by placing it perpendicular and inside the Coil's inside surface. WA-Series Coils are designed to comply with specifications requiring Residual and/or Active Fields.

WAD Power Supply produces an AC field or a 60Hz (50Hz) Pulsed DC field, which has a tendency to have Wet or Dry Method Particles migrate toward defects. When operated a V1 Module in DC Mode (DC1 to DC5), the output varies from a maximum of 4000 Amp Turns. The five levels of DC (V1 controls) or the Infinitely Variable (V2 Controls) are designed for larger or smaller workpieces. When operating a V2 Module in DC Mode, the Maximum output is 4000 Amp Turns, and is 0 when the potentiometer is set to the minimum position. When inspecting outside threads on shafts or tubes test with AC or DC, the rule of thumb is 1200 Amp Turns per inch of OD. When Inspection inside threads on tube and pipe, only a DC Field is permitted.

WAC Power Supply produces an AC field, and is not designed to induce a Residual Field as the Push Button Activation Switch does not control where the AC wave is cut off.

WDC-10/24 Power Supply produces a DC Field, and leaves a residual field in the workpiece after inspection. This unit is only recommended for seasoned MPI Technicians due to the low level of particle movement. There is no prevision for the Demagnetization of the workpiece.

- 5. Operation** - The Coil is either placed on the Work Piece, such as a threaded end of a pipe, or if the Work Piece is small it can be held within the inside of the coil. If held and if it is short enough to be rotated within the coil either a longitudinal or transverse field can be induced into the Work Piece. Application of particles, depending on the specification and skill of the operator, can be applied during (Active Field) or after (Residual Field) the field is set-up in the Work Piece. Active Field Inspection requires less skill by the operator in the application of the particles, while in Residual Field Inspection there is no particle migration.

WAD Models are place over the Work Piece, and the operator can select an AC or DC field. If an AC field is desired, the operator simply presses

the Push Button Switch to activate the coil. While the coil is activated magnetic particles are applied (wet or dry method), then the Switch is released and the workpiece inspected. If the coil (or workpiece) is removed while the coil is activated, the part will be demagnetized and indications of flaws may not show up.

If a DC field is desired, the operator may select one of the 5 preset intensities. Selection of field strength is a function of the size (mass) of the workpiece and its magnetic permeability. The larger the workpiece (or the lower the permeability) the greater the field strength will need to be. After the operator has selected the field strength, the Coil is placed on workpiece (or the workpiece within the coil). For Active Field inspection, the coil is activated and magnetic particles are applied to the workpiece. While the coil is activated it is removed from the workpiece and the part is then inspected. For Residual Field inspection, simply activate the coil on the workpiece; remove it; apply magnetic particles; and then inspect it.

After the inspection is complete, the workpiece can be demagnetized by setting the Field Selection Switch to AC; activate the field; and move the coil on and off the workpiece (or pulling the workpiece through the coil). Western Instruments recommends the use of a Magnetic Field Indicator (Gauss Meter), such as the W-FI®, to ensure the magnetic field is removed, from the workpiece, after demagnetization.

DO NOT CHANGE THE FIELD SETTINGS, on the WAD-10, FROM AC TO DC WHILE THE COIL IS ACTIVATED!

WAC Models are placed over the Work Piece, and the operator simply presses the Push Button Switch to activate the coil. If the workpiece is small enough, it may be held in the center of the coil, and a transverse or longitudinal field applied. While the coil is activated magnetic particles are applied (wet or dry method), then the Switch is released and the workpiece inspected. If the coil (or workpiece) is removed while the coil is activated, the part may be demagnetized and indications of flaws may not show up. A residual field may be induced in the workpiece if the coil happens to be deactivated at either a positive or negative cycle on the AC power feed, and it is good practice to demagnetize after the inspection is complete.

After the inspection is complete, the workpiece can be demagnetized by; activating the field; and move the coil on and off the workpiece (or pulling the workpiece through the coil). Western Instruments recommends the use of a Magnetic Field Indicator (Gauss Meter), such as the W-FI®, to ensure the magnetic field is removed, from the workpiece, after demagnetization.

WDC-10/24 Models are simply placed on the workpiece, and the operator energizes the coil with the Momentary Toggle switch. This unit is only recommended for seasoned MPI Technicians due to the low level of

particle movement. There is no provision for the Demagnetization of the workpiece.

6. Maintenance - After extended use, WC-Series Coils should be cleaned with a mild soap solution. The unit should be visually inspected regularly for any damage that could cause harm to the operator, or the material being inspected. Special attention should be paid to the coil controls and the power cord (cable). Any potential problems to these assemblies must be reported to the distributor or Western Instruments for instructions on corrective action.

Other than routine maintenance, the operator can expect a longer service life. Depending on the Industry or in-house specification utilized, and the type of service (field or shop), the assembly should be calibrated at regular intervals to ensure proper operation. Furthermore, during calibration the field produced by the coil should be tested to ensure there is no reduction in the performance of the unit.

The distributor or Western Instruments should be contacted for any specific instructions on maintenance, due to the specific environment of operation. Repairs, that need to be carried out on the product, must be performed by an authorized service depot or Western Instruments.

Wiring – Western Instruments 230 Volt Models, are designated by a “K” placed after the Serial Number and the Models number (e.g. WAC-10K), are shipped without an AC Power Plug as there is no international standardization. When installing an AC Power Plug onto the AWG 16-3 Power Cord, the following is the identity of the 3 Color Coded Conductors;

- Green – Ground
- White - Neutral
- Black – Live

Care must be taken to insure the proper installation of an AC Power Plug, and if there is any question, contact your distributor or Western Instruments. If an AC Plug is not installed before use, any warranty is void.

The WDC-10/24 is equipped with a 2 Conductor Cable, with Small *Alligator* Clips for attaching it to the 24VDC Power Supply (Batteries). The White wire on the Power Cord is connected to the Red or Positive (+) Clip and the Black wire is connected to the Black or Negative (-) Clip. Conversely, the Clips on the Power Cord follow the same designation, Red for Positive and Black for Negative. Reversal of these wires, and the resulting polarity, will cause the Output Module to fail.

Warranty: Western Instruments warrants all WA-Series Coils against defects in materials and workmanship for a period of 1 year from receipt by the end user. Consumable items are warranted against defects in materials and workmanship for 30 days from receipt by the end user. If Western Instruments receives notice

of such defects during the warranty period, Western Instruments will either, at its option, repair, replace, or condemn products that prove to be defective.

Any warranty is void if the unit has been modified in any way, mistreated, or if it has been repaired by an unauthorized agency. The end user agrees that any equipment's disposition, when returned for warranty work, is at the full discretion of Western Instruments as to whether a claim is under warranty, or due to misuse. Western Instruments warranty shall overlook normal wear, however does not include operation outside the environmental specification of the product. Any warranty work is FOB western Instruments, and any returned units shall include a written description of the fault, by the end user.

Western Instruments makes no other warranty, either expressed or implied, with respect to this product. Western Instruments specifically disclaims any liability arising from the use of this equipment. For the correct use of Western Instruments W-Series Coils refer to the Operating Instructions, furthermore we recommend instructional training to CGSB or ASNT qualifications. Western Instruments highly recommends the end user exercises all possible safety precautions, including the use of protective equipment, while operating this or other industrial equipment.

Specifications:



Models: WAC-10 (AC), WAD-10 (AC/DC), WDC-10/24 (24VDC)
Voltage: 115 VAC/60 Hz, 230 VAC/50Hz, 24 VDC (Nominal Voltage)
Current: 14 Amps at 115 VAC
 8 Amps at 230 VAC.
 8 Amps at 24 VDC
Capacity: WAC-10, 3000 Amp Turns AC (Minimum)
 WAD-10, 3000 Amp Turns AC or 4000 Amp Turns DC (Minimums)
 WDC-10/24, 3500 Amp Turns DC.
Size: 10" (255mm) Inside Diameter.
Weight: 15 pounds (7kg). WDC-10/24 is 22 Pounds (10kg)

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